

## **Title: Apples. . . Let's Take a Bite of Mathematics**

### **Brief Overview:**

The hierarchy of learning patterns is that children learn to copy patterns, continue patterns, describe patterns, given a description of patterns build patterns, create patterns, make predictions and finally organize information to find regularity in the data collected. Repetition of activities helps children to begin thinking from a concrete to an abstract way of thinking.

These activities use apples to reinforce the concepts of patterning. PreK students will copy and continue patterns as well as begin to create patterns. Older students build patterns according to a description and predict the  $n$ th term, organize data, and use the data to solve problems.

### **NCTM 2000 Principles for School Mathematics:**

- **Equity:** *Excellence in mathematics education requires equity - high expectations and strong support for all students.*
- **Curriculum:** *A curriculum is more than a collection of activities: it must be coherent, focused on important mathematics, and well articulated across the grades.*
- **Teaching:** *Effective mathematics teaching requires understanding what students know and need to learn and then challenging and supporting them to learn it well.*
- **Learning:** *Students must learn mathematics with understanding, actively building new knowledge from experience and prior knowledge.*
- **Assessment:** *Assessment should support the learning of important mathematics and furnish useful information to both teachers and students.*
- **Technology:** *Technology is essential in teaching and learning mathematics; it influences the mathematics that is taught and enhances students' learning.*

### **Links to NCTM 2000 Standards:**

- **Content Standards**

- **Number and Operations**

- Count with understanding and recognize "how many" in sets of objects;
    - Understand various meanings of addition and subtraction of whole numbers and the relationship between the two operations;
    - Develop and use strategies for whole-number computations, with a focus on addition and subtraction;
    - Use a variety of methods and tools to compute, including objects, mental computation, estimation, paper and pencil, and calculators.

### **Algebra**

- Sort, classify, and order objects by size, number, and other properties;
- Recognize, describe, and extend patterns such as sequences of sounds and shapes or simple numeric patterns and translate from one representation to another;
- Analyze how both repeating and growing patterns are generated;
- Illustrate general principles and properties of operations, such as commutativity, using specific numbers;
- Use concrete, pictorial, and verbal representations to develop an understanding of invented and conventional symbolic notations;
- Model situations that involve the addition and subtraction of whole numbers, using objects, pictures, and symbols;
- Describe qualitative change, such as a student's growing taller;
- Describe quantitative change, such as a student's growing two inches in one year.

### **Data Analysis and Probability**

- Pose questions and gather data about themselves and their surroundings;
- Sort and classify objects according to their attributes and organize data about the objects;
- Represent data using concrete objects, pictures, and graphs;
- Discuss events related to students' experiences as likely or unlikely.

## **Process Standards**

### **Problem Solving**

- Build new mathematical knowledge through problem solving;
- Solve problems that arise in mathematics and in other contexts;
- Apply and adapt a variety of appropriate strategies to solve problems;
- Monitor and reflect on the process of mathematical problem solving.

### **Reasoning and Proof**

- Recognize reasoning and proof as fundamental aspects of mathematics;
- Develop and evaluate mathematical arguments and proofs;
- Select and use various types of reasoning and methods of proof.

### **Communication**

- Organize and consolidate their mathematical thinking through communication;
- Communicate their mathematical thinking coherently and clearly to peers, teachers, and others;
- Analyze and evaluate the mathematical thinking and strategies of others;
- Use the language of mathematics to express mathematical ideas precisely.

### **Connections**

- Recognize and use connections among mathematical ideas;
- Understand how mathematical ideas interconnect and build on one another to produce a

- coherent whole;
- Recognize and apply mathematics in contexts outside of mathematics.

### **Representation**

- Create and use representations to organize, record, and communicate mathematical ideas;
- Select, apply, and translate among mathematical representations to solve problems;

### **Grade/Level:**

PreK-2

### **Duration/Length:**

6 lessons

### **Student Outcomes:**

Students will:

- Copy and continue a pattern
- Create and describe a pattern
- Complete a “T” table and use information to solve a problem
- Create a graph to represent information
- Choose combinations of objects when given a value
- Create matching sets
- Identify multiples of numbers of objects in a set

### **Development/Procedures:**

#### **Activity 1 – Beginning**

#### **Prerequisite Knowledge:**

Students should have working knowledge of the following skills:

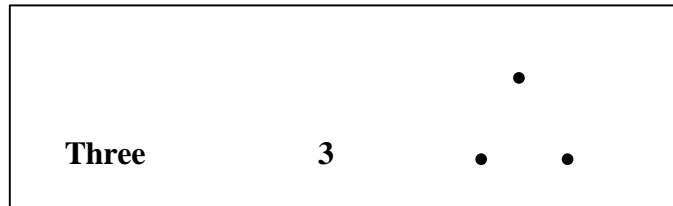
- Color recognition
- One to one correspondence

#### **Materials:**

- Numeral, number word, pictorial card
- Red, green, yellow apples
- Red, green, yellow unifix cubes
- Red, green, yellow apple pattern cards

#### **Introduction:**

- Introduce the three different colors of apples (red, green, yellow) to the students.
- Have students sort the apples into three groups.
- Have students count the apples in each group.
- Label each group with the numeral, number word, and pictorial representation of each set of apples. For example three red apples:



### Activity:

- Create an AB pattern for the students to look at.
- Ask the students to copy the pattern using matching color apples, unifix cubes, or paper cutouts of apples, etc.  
     Red, green, red, green, . . .                      Green, red, green, red, . . .  
     Green, yellow, green, yellow, . . .            Red, yellow, red, yellow, . . .
- Ask why “X” color is next.
- Ask how they solved the problem.
- Create an ABC pattern for the students to look at.
- Ask the students to copy the pattern using matching color apples, unifix cubes, or paper cutouts of apples, etc.  
     Yellow, green, red, yellow, green, red, . . .  
     Yellow, red, green, yellow, red, green, . . .  
     Green, yellow, red, green, yellow, red, . . .  
     Green, red, yellow, green, red, yellow, . . .  
     Red, yellow, green, red, yellow, green, . . .  
     Red, green, yellow, red, green, yellow, . . .

### Extensions:

- Have students create simple patterns using physical movement, unifix cubes or other manipulatives.  
     clap, snap, pat, clap, snap, pat, clap, snap, pat . . .  
     tap, stomp, blink, tap, stomp, blink, tap, stomp, blink, . . .  
     black, red, white, black, red, white, black, red, white, . . .  
     green, blue, white, green, blue, white, green, blue, white, . . .
- Have the students describe the patterns they created.
- Have students create AAB pattern, i.e. red, red, green, . . .
- Language Experience Journal  
     Ask the students, “What other objects or things can you use to create patterns?” “What patterns do you see in real life?” Write the answers on the journal paper.

### Assessment:

- Observation of the children is important. Take notes to keep track of students’ progress.

## **Activity 2 – Data Gathering**

### **Prerequisite Knowledge:**

Students should have working knowledge of the following skills:

- Color recognition
- One to one correspondence
- Data gathering
- Interpreting Data

**Materials:**

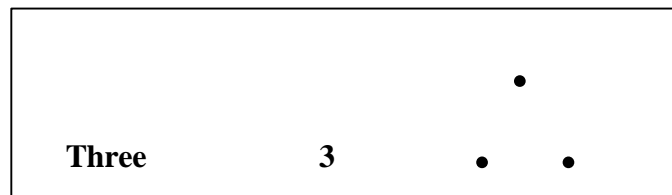
- Apples
- Knife
- Cutting board
- Sweet/Sour prediction graph
- Which Apple Do You Like? Graph
- Sticky notes

**Introduction:**

- Show the students different types of apples; i.e., Granny Smith, Red Delicious.
- Tell the students that some apples are sweet and some apples are sour. Some apples are crunchy and some apples are soft.

**Activity:**

- Predictions:
  - Ask the students to predict what the apples will taste like. Will the red apples be sweet or sour? Will the green apples be sweet or sour?
  - Using sticky notes, have children place the sticky notes on a graph that says “Sweet or Sour” for the red apples. Then have children place the sticky notes on a graph that says “Sweet or Sour” for the green apples.
  - Count how many children say the red apples will be sweet and how many will be sour. Then count how many children say the green apples will be sweet or sour.
- Label each group with the numeral, number word, and pictorial representation for each group of sweet or sour apples. For example three sweet red apples:



- Language Experience Journal:
  - Ask students how and why they made their decisions. “Why did you think that a red apple would be sour or sweet?” “Why did you think that a green apple would be sour or sweet?”
  - Write the answers on the journal paper.
- Cutting the apples
  - Tell the students what you are doing with the apples. “I am cutting the apple in half. I now have two halves. I will now cut each half in half again. How many apple pieces do you think we will have when I cut each piece of apple in half again? I now have four pieces of apples.”
  - Have the children taste the apple pieces.
- Gathering Data
  - Use a graph labeled **Which Apple Do You Like?** See Teacher Resource Sheet # 1. One half of the paper is labeled Red Apples and the other half is labeled Green Apples.

- With the children's names on the sticky note, ask students to place the sticky note on the graph paper under the heading Red Apples or Green Apples for the apple they like better.
- Count the total number of children on each side of the graph. Do more students like red apples or green apples?

**Extensions:**

- For older children, use several different types of apples i.e., Golden Delicious, Gala, or Macintosh apples.

**Assessment:**

- Observation of the children is important. Take notes to keep track of students' progress.
- Give the students a core of boy, boy and girl, and girl, and have students represent the core in two different ways using other items (i.e., manipulatives, pictures, stickers, etc.)

**Activity 3 -- What color is the apple?**

**Prerequisite Knowledge:**

Students should have working knowledge of the following skills:

- Color recognition
- One to one correspondence
- Building a pattern given a description
- Predicting a pattern

**Materials:**

- Task cards
- Recording sheet
- Manipulatives
- Crayons

**Introduction:**

- Show the students that there are patterns everywhere. We see patterns in everyday life.
- Have children look for patterns within the room i.e., how are your students sitting – boy, girl, boy, girl; desk, chair, desk, chair – if your room is set up in rows.

**Activity:**

- Model a problem using the first task card. Task cards can be found on Student Resource Sheets # 1-3.
  - Have students use manipulatives to model the first 5 apples.
  - Ask them to predict what color the special apple will be.
  - Go over several examples to reinforce the activity. Remind the students to read and follow directions on the task cards.
- Have students choose a task card and write the card letter on the recording sheet (Student Resource Sheet # 4).
- Students read the directions for the pattern on the task card, and predict what color the special apple will be.
- Next the students color in the pattern on the recording sheet.
- Finally, the students write the color of the special apple.

**Assessment:**

- Observation of the children is important. Take notes to keep track of students' progress.
- Create a pattern that is orange, green, orange, red. Place the pattern in an empty paper towel

roll. Show the students the first orange cube, then the second green cube, then the third orange cube. Ask the students, “Knowing what you know about patterns, what do you think the next color cube will be?” The students will probably say, “Green.” Show the students the fourth red cube. Ask the students to continue the pattern using their own unifix cubes. Then ask the students, “What is the 12<sup>th</sup> unifix cube?”

#### **Activity 4 – Apple Pies**

##### **Prerequisite Knowledge:**

Students should have working knowledge of the following skills:

- Using a table to organize information and find regularity in the data
- Using a calculator with a constant arithmetic function (optional)
- Counting by multiples on a hundred chart
- Using manipulatives to model solutions to real-life problems.

##### **Materials:**

- Student Resource Sheet # 5: Apple Pie
- Manipulatives (i.e., unifix cubes, pattern blocks) to represent apples
- Calculators with a constant arithmetic function
- Student Resource Sheet # 6: Hundred Chart

##### **Introduction:**

- Read *How to Make an Apple Pie and See the World* by Marjorie Priceman or *The Apple Pie Tree* by Zoe Hall.
- Talk about how apple pies are made. Make an apple pie with the class. Eat apple pie.

##### **Activity:**

- Divide class into cooperative groups of 2-4 students.
- Give students Student Resource Sheet # 5: Apple Pie. Explain the problem. Do not give them a method for solving it. They may choose any of several ways.
  - Use a calculator with a constant arithmetic function to repeatedly add 6; record the results in a table. (They enter  $0 + 6 = = \dots$ )
  - Use a hundred chart (Student Resource Sheet # 6: Hundred Chart) and color in every 6<sup>th</sup> square to find the answer
  - Use ten groups of six manipulatives to model the answer.
  - Make a table and add 6 to the result column.
  - Student-generated method
- An answer sheet (Teacher Resource Sheet # 2 – Answers) is provided for the Apple Pie resource sheet.

##### **Extension/Follow Up:**

- Have students explore relationships between the pies and variables such as teaspoons of cinnamon, scoops of ice cream, or number of slices per pie.

### **Activity 5 – Buying Apples**

#### **Prerequisite Knowledge:**

Students should have working knowledge of the following skills:

- Coins and their values
- Computing money
- Seeing and predicting patterns

#### **Materials:**

- Apples
- Stickers (for price tags)
- Money (real or plastic)
- Student Resource Sheets # 7a-b: Buying Apples
- Student Resource Sheet # 8: Small Apples
- Crayons

#### **Introduction:**

- Review coins and their values.
- Review adding money.

#### **Activity:**

- Show students apples with price marked on them: Red apples cost 10 cents. Yellow apples cost 15 cents. Green apples cost 20 cents.
- Make money available for students to count, if necessary.
- Model making a combination of apples that equals 40 cents. Let students think, pair and share to practice making combinations. Allow them to share their solutions.
- Give students Student Resource Sheet # 7: Buying Apples. Explain the problem to the students. Be sure they understand that the target value has been changed to 50 cents. Have Student Resource Sheet # 8: Small Apples available for students who need manipulatives to figure out correct solutions.
- Students' papers must show at least 2 of the following: appropriate equations that add to 50, diagrams that show the apples or correct explanations for each separate item.

#### **Extension/Follow Up:**

- Buying apples: Students can use other amounts (i.e., \$1.00) or find the price for the apples in a red apple pie, a yellow apple pie, and a green apple pie.

### **Activity 6 – Bagging Apples**

#### **Prerequisite Knowledge:**

Students should have working knowledge of the following skills:

- Seeing and predicting patterns
- Using manipulatives to model solutions to real-life problems

#### **Materials:**

- Lunch bag containing 1 apple, 2 cookies, and one sandwich
- See-through plastic bags or boxes
- One bag/box already prepared with 3 red apples, 4 yellow apples, and 2 green apples
- Unifix cubes or other manipulatives to represent food items
- Student Resource Sheets # 9a-b: Bagging Apples
- Student Resource Sheet # 8: Small Apples



**Introduction:**

- Show contents of lunch bag. Ask students how many apples it would take to make lunch for 1 student, 2 students, 5 students, and the whole class. Repeat questions for the cookies.

**Activity:**

- Divide class into cooperative groups of 3-4 students.
- Give each group a lunch bag and have them fill it with apples following the proportions on Student Resource Sheet # 9a: Bagging Apples.
- Ask: What is in each lunch bag? How many apples are there in all?
- Begin a table on the board. Ask: How many apples would you need to make 3 lunch bags? How many for 4 lunch bags? How many for 10 lunch bags? If you had 18 apples, how many lunch bags would that fill?
- Give students copies of Student Resource Sheet # 8: Small Apples to use as manipulatives, if necessary.
- Students' papers must show appropriate equations and diagrams that show the apples in each bag.

**Assessment:**

- After completing Activities 2-4, give students Student Resource Sheets # 10a-b: Your Restaurant. All students should complete the first three problems. The fourth problem (How much will you pay for all the apples?) is an extension. Student answers should indicate a clear understanding of the problem, an appropriate solution, and correct mathematical reasoning.

**Extension/Follow Up:**

- Bagging apples: Have groups plan a "brown bag picnic". They will plan a lunch bag menu for the entire class and decide how many of each item they will need. Be sure they do not just plan one of each item per class member.

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Teacher Resource Sheet # 1 -- Graph

Which Apple Do You Like?

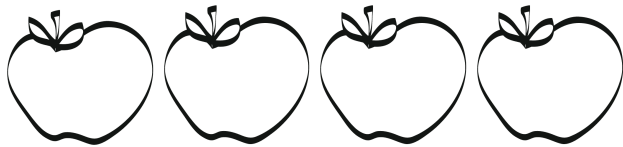


## Card A

This is an AB pattern with red and green apples.

It starts with a red apple.

Number 8 is the special apple. What color is it?

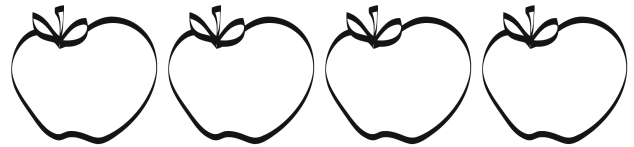


## Card B

This is an AB pattern with yellow and red apples.

It starts with a yellow apple.

Number 5 is the special apple. What color is it?

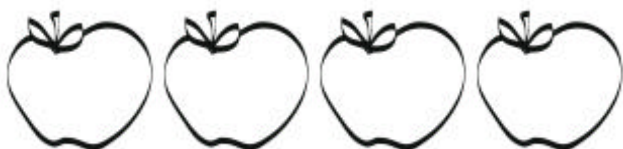


## Card C

This is an AABB pattern with green and yellow apples.

It starts with a green apple.

Number 9 is the special apple. What color is it?

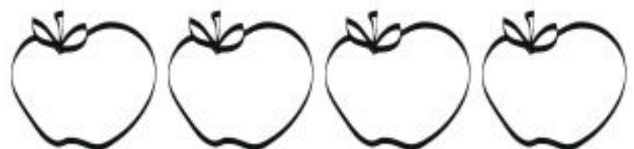


## Card D

This is an AABC pattern.

It is red, then yellow, then green.

Number 10 is the special apple. What color is it?

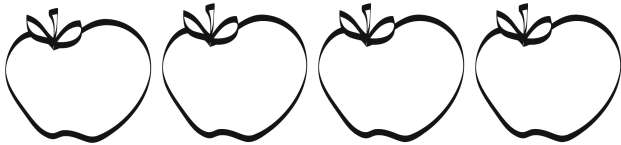


## Card E

This is an ABAC pattern.

It is green, then yellow, then red.

Number 6 is the special apple. What color is it?

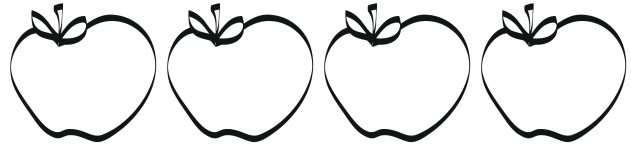


## Card F

This is an ABCC pattern.

It is red, then yellow, then green.

Number 10 is the special apple. What color is it?



## Card G

This is an ABBC pattern.

It is yellow, then green, then red.

Number 8 is the special apple. What color is it?



## Card H

This is an ABBB pattern with red and green apples.

It starts with a green apple.

Number 10 is the special apple. What color is it?

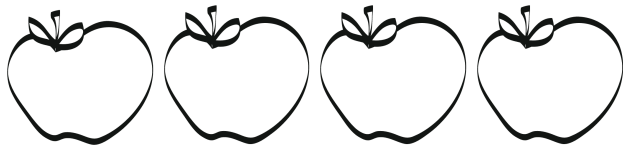


## Card I

This is an ABA pattern with red and yellow apples.

It starts with a red apple.

Number 6 is the special apple. What color is it?

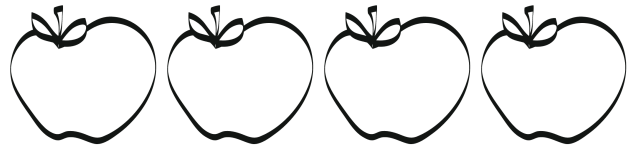


## Card J

This is an ABCB pattern.

It is yellow, then green, then red.

Number 9 is the special apple. What color is it?

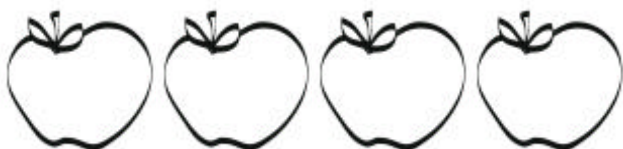


## Card K

This is an ABACB pattern.

It is green, then red, then yellow.

Number 8 is the special apple. What color is it?

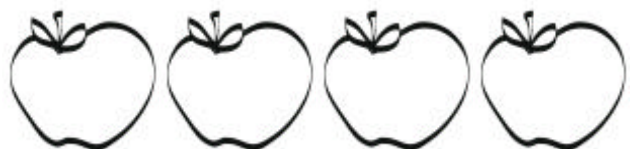


## Card L

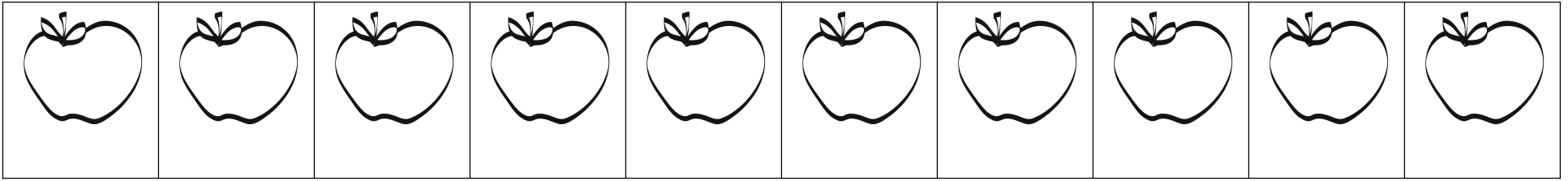
This is an ABCAC pattern.

It is red, then green, then yellow.

Number 7 is the special apple. What color is it?



Name \_\_\_\_\_

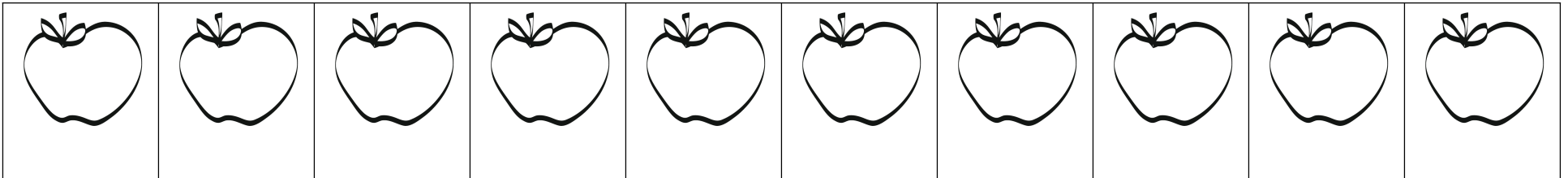


Card \_\_\_\_\_ The special apple is number \_\_\_\_\_

What color do you think it is ? \_\_\_\_\_

Color the apples. Circle the special apple.

What color is it? \_\_\_\_\_



Card \_\_\_\_\_ The special apple is number \_\_\_\_\_

What color do you think it is ? \_\_\_\_\_

Color the apples. Circle the special apple.

What color is it? \_\_\_\_\_

Name \_\_\_\_\_

## Apple Pie

Your teacher needs to make apple pies for the school carnival. It takes 6 apples to make one pie. How many apples does it take for 10 apple pies?

Show how you know.

Name\_\_\_\_\_

Apple Pie

Your teacher needs to make apple pies for the school carnival. It takes 6 apples to make one pie. How many apples does it take for 10 apple pies?

<p>Use a calculator with a constant arithmetic function:</p> <table><tr><th>Pies</th></tr><tr><th>Apples</th></tr><tr><td>1</td></tr><tr><td>2</td></tr><tr><td>3</td></tr><tr><td>4</td></tr><tr><td>5</td></tr><tr><td>6</td></tr><tr><td>7</td></tr><tr><td>8</td></tr><tr><td>9</td></tr><tr><td>10</td></tr><tr><td>6</td></tr></table>	Pies	Apples	1	2	3	4	5	6	7	8	9	10	6	<p>Use a hundred chart and color in every 6<sup>th</sup> square:</p> <table><tr><td>1</td></tr><tr><td>2</td></tr><tr><td>3</td></tr><tr><td>4</td></tr><tr><td>5</td></tr><tr><td>6</td></tr><tr><td>7</td></tr><tr><td>8</td></tr><tr><td>9</td></tr><tr><td>10</td></tr><tr><td>11</td></tr><tr><td>12</td></tr><tr><td>13</td></tr><tr><td>14</td></tr><tr><td>15</td></tr><tr><td>16</td></tr><tr><td>17</td></tr><tr><td>18</td></tr><tr><td>19</td></tr><tr><td>20</td></tr></table>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
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## Hundred Chart

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Name\_\_\_\_\_

## Buying Apples

Your mother sends you to the store to buy apples. She gives you 50 cents to spend.

Red apples cost 10 cents.

Yellow apples cost 15 cents.

Green apples cost 20 cents.

1. What is the greatest number of apples you can buy?  
Show how you know.

2. What is the least number of apples you can buy?  
Show how you know.

Remember, you have 50 cents to spend.

Red apples cost 10 cents.

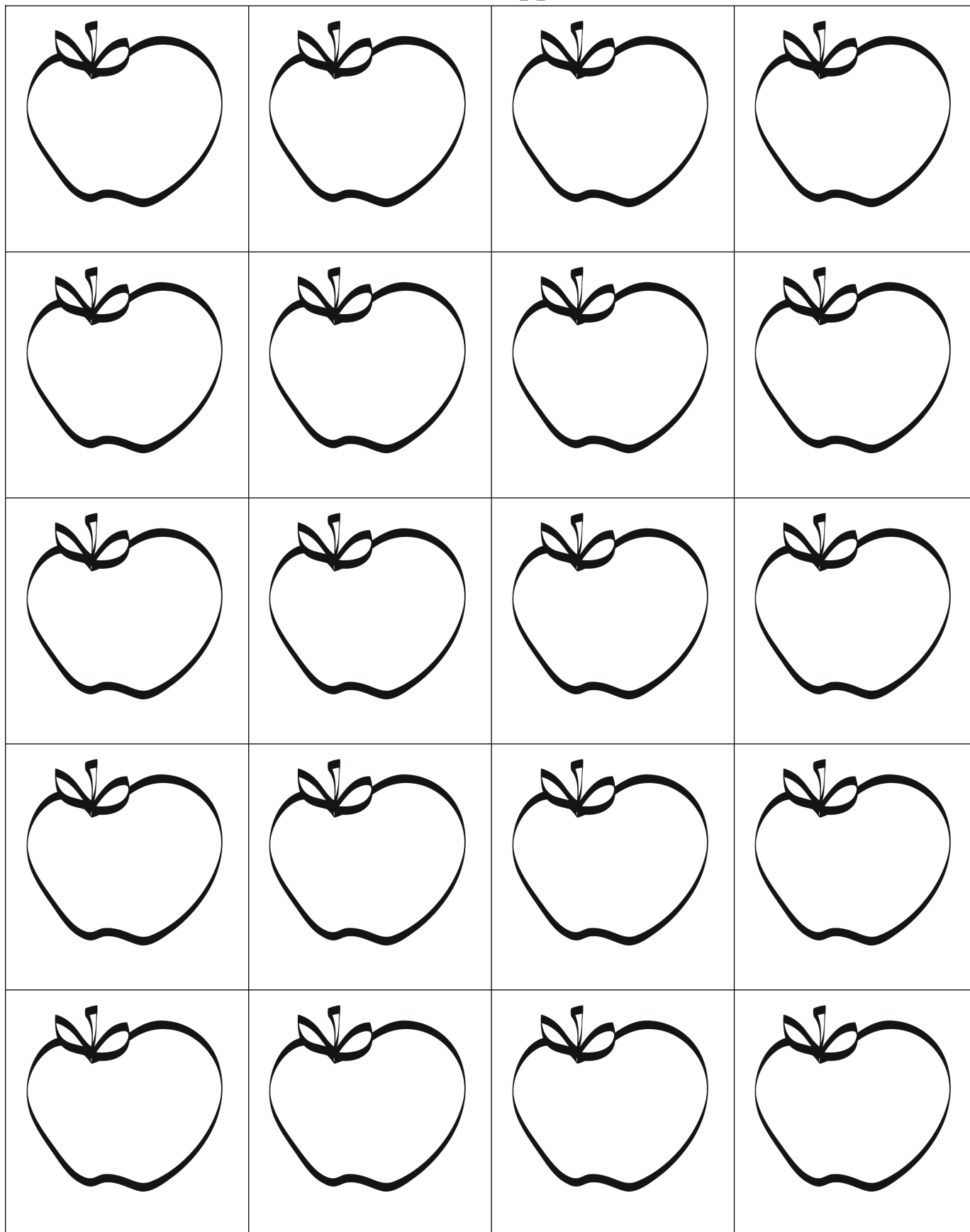
Yellow apples cost 15 cents.

Green apples cost 20 cents.

3. Make another combination that you can buy. Show how you know.

4. Make another combination that you can buy. Show how you know.

# Small Apples



Name\_\_\_\_\_

## Bagging Apples

Farmer Gwen is bagging her apples to sell at the farmers market. Each bag contains 3 red apples, 4 yellow apples, and 2 green apples.

1. How many red apples will you need for 5 bags? Show how you know.
2. How many green apples will you need for 8 bags? Show how you know.
3. How many bags can you make if you have 16 yellow apples? Show how you know.

4. How many apples will there be in 7 bags? Show how you know.
5. Farmer Gwen needs 12 bags of apples. How many red apples will she need? How many green apples will she need? How many yellow apples will she need? Show how you know.

5. Farmer Gwen needs 12 bags of apples. How many red apples will she need? How many green apples will she need? How many yellow apples will she need? Show how you know.



Name \_\_\_\_\_

### Your Restaurant

You are opening a pie restaurant. You will need to make 6 extra large pies everyday. An extra large pie takes 8 green apples. How many green apples will you need? Show how you know.

You go to buy green apples. You have to buy mixed bags of apples. Each bag has 4 green apples, 4 red apples, and 4 yellow apples. How many bags will you buy? Show how you know.



Red apples cost 10 cents. Yellow apples cost 15 cents. Green apples cost 20 cents.

A bag has 4 red apples, 4 yellow apples, and 4 green apples.

How much does a bag of apples cost? Show how you know.

How much will you pay for all of the apples?